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Prethodno priopćenje

APPLICATION OF BENCHMARKING AS A MANAGERIAL TOOL in prefabricated building construction

The article describes practical application of benchmarking as a method for comparative assesment of companies, engaged in prefabricated construction. For the application of benchmarking in practice three producers of prefabricated houses have been selected. The subject of comparision has been the construction of prefabricated houses where the following keys of performance have been applied:

- construction time
- price
- quality.

The measurement and comparision of company's results with those of its competitors have provided useful information on how to improve business efficiency. The results obtained with the benchmarking method have served as a basis for the elaboration of improvement plan aiming to improve the following domains of business activities: technology, sales and purchase, price policy, financing and marketing. In this way benchmarking represents a useful tool for both managers and companies - a tool for the acquisition of new applicable knowledge and for better decision making of managers.

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Introduction

Benchmarking or comparative assessment method was introduced by the corporation Xerox in 1979. The method was first meant to compare the achievements of competitive companies while nowadays its main significance is to enable learning from assessment.

Various authors determine benchmarking differently. Spendolini (1990) refers to benchmarking as a continuous, systematic process of evaluation and comparison of products, services, working processes, operations and business functions of organizations representing the best practices, aiming at the improvement of organization. Therefore, benchmarking as a managerial tool facilitates the acquisition of information on competitive companies and markets thus contributing to better decision making and greater competition. It supports better fulfilment of customer needs, setting of goals on the basis of external conditions, achievement of better competitive position, definition of viable productivity rules, awareness of the best practices and searching of them (Camp, 1989). Consequently, benchmarking is the component part of strategic planning or in other words Strategic benchmarking is searching for and adopting successful strategies of the best world practices (Behara, Lemmink, 1997).

However, this can only be achieved by means of a systematic approach comprising according to Spendolini (1990):

1. Determination of a subject of comparison
2. Appointment of benchmarking team
3. Identification of benchmarking subjects
4. Collection and analysis of benchmarking information
5. Benchmarking implementation.

Boxwell (1994) goes one step further. Within benchmarking he identifies eight phases aimed to:

1. determine the activity being a subject of comparison
2. define the measurement key factors
3. identify companies achieving excellent results in practice
4. provide for self measuring of results
5. compare proper results with those of the best practices
6. develop the improvement plan
7. provide for better involvement of managers and staff in the implementation of envisaged measures
8. carry out the improvement plan and follow-up its results.

Within benchmarking one should distinguish several kinds of comparison (See Table 1) as follows:

- Comparison between competitive companies (external competitive benchmarking)
- Comparison between business functions and business processes within a company (internal benchmarking)
- Comparison with the best world practices (external industrial benchmarking)
- Combination of internal and external benchmarking.

Table 1

COMPARISON OF INDIVIDUAL KINDS OF BENCHMARKING

Type of benchmarking	Cooperation between participants	Importance of information	Improvement rate	Duration
Internal benchmarking	good	great	low	3 – 4 months
External competitive benchmarking	bad	great	medium	6 – 12 months
External industrial benchmarking	average	average	high	10 – 14 months
Combination of external and internal benchmarking	average	average	very high	12 – 24 months

Source: Adapted according to Harrington, H.J., & Harrington, J.S.: High Performance: 20 steps to success, USA 1997, pages 34 – 37.

Fields on which benchmarking can be practically applied in order to improve the business operation comprise a very large range. Further, one can find in theory and in practice different variants of benchmarking process application and their division into a number of phases. It is reasonable to incorporate benchmarking in the entire business operation and in all company activities. With a view to demonstrate a concrete example of benchmarking and considering individual activities

of strategic management, it is interesting to distinguish between four types of benchmarking (J. Prašnikar and others, page 7, 2002), namely:

- benchmarking task of competitive priorities meaning to create knowledge of factors on which the competitive priorities are based;
- benchmarking task of strategies meaning to create knowledge of strategies characteristics;
- benchmarking task of process meaning to create knowledge of processes characteristics comprising planning, concepts, implementation and supervision of various business processes and activities;
- benchmarking task of achievements meaning to create knowledge of achievements of competitive and other companies in order to evaluate and compare one's own achievements.

The companies should choose appropriate criteria for the evaluation of achievements. They can only get a proper picture of their own achievements when comparing them with those of other companies operating in identical conditions and business environment.

The above stated theoretical findings may be reduced to the following four findings:

1. Benchmarking enables comparison with the best practices as well as identification of gaps.
2. Use of benchmarking as a managerial tool facilitates the achievement of business excellency.
3. Benchmarking as a long-term and systematic process requires a long-term policy and active involvement of employed managers.
4. Benchmarking means learning and bringing new ideas into companies.

Companies can use benchmarking in different ways. Benchmarking enables companies to incorporate strategic planning and enhance business efficiency. Findings based on benchmarking help managers to provide better decision-making. They also stimulate changes and enhance staff readiness for the transformation of companies and other structural changes. In spite of knowing many benefits of benchmarking process its application in business practice is still unsatisfactory. The professional literature offers definitions of several variants of benchmarking made by numerous authors but it does not offer the analysis of problems encountered during the benchmarking introduction. And the latter should be the subject of studies in the future.

Application of benchmarking in practice

Here follows an example of practical application of benchmarking process in Slovenian company Riko Hiše d.o.o. (Riko Houses Ltd.). For this purpose a short description of the company is first given; it is followed by a demonstration of benchmarking process and its results and finally by a presentation of indicative improvement plan.

From 1955 onwards the company Riko Hiše d.o.o. with its registered office in Ribnica manufactures solid wood bio-houses RIKO on the basis of widely experienced German patent. The houses are of high quality and belong to upper price category. The production of houses was first intended merely to supply the Austrian and German market but from 1998 onwards the bio-houses Riko have also been meant for Slovenian customers. Their market share on Slovenian prefabricated houses market has been 2,34 % (Source: Enclosure to the magazine "Les" of 9.3.2001). The company has directed its strategy to the enlargement of production scope, improvement of business efficiency and increase of export rate and has consequently decided to apply the benchmarking method. This decision has also been encouraged by an increasing trend of enquiries for prefabricated houses due to changes of the population dwelling habits, especially in Western European countries, where according to statistics more than 20 % of all residential buildings are of prefabricated type. It is important to know that prefabricated houses have numerous advantages, such as quick construction and assembly, seismic safety, durability, acoustic and thermal insulation as well as exterior able to adapt to the environment or landscape. For this reason the decision of Riko hiše d.o.o. to research the prefabricated houses production and market characteristics has been the correct response.

The basic starting-points to be considered during the implementation of benchmarking process are:

- Riko Hiše d.o.o. manufactures prefabricated houses of a limited scope (50 houses per year).
- Marketing includes technology as well.
- Marketing of Riko houses is directed to European markets, especially to the German and Austrian market.
- Potential markets: Turkey, Spain and Portugal.

As to data collection the methods have been used in accordance with available capital and time schedules. These methods have included secondary data which have already been collected (articles, magazines, internet, statistical data) and newly collected data (interviews, visits of benchmarking partners). At first

the data collection has concerned mostly the internal data while later, when the benchmarking process has further developed, it has also been extended to external data collection and their analysis.

Wherever the benchmarking method is applied in prefabricated houses production the following limitations should be respected:

- The selected producers of prefabricated houses use different technologies and consequently the definition of quality-price ratio is not easy or simple.
- The company does not have appropriate statistical data available which would enable an integral comparison between competitive companies.

Progress of benchmarking project in Riko Hiše d.o.o.

The practical implementation of benchmarking includes (See Table 2):

1. Selection of three companies from Slovenia, namely Jelovica (Jelovica Hiše), Marles (Marles Hiše) and Riko (Riko Hiše d.o.o).

The choice of benchmarking partners is a very demanding task but on the basis of available information we could choose the above mentioned benchmarking partners which were ready to participate in benchmarking process.

2. Identification of efficiency keys relevant for prefabricated house production, namely TIME, PRICE and QUALITY.

It is necessary to measure and compare the efficiency of organization with that of its competitors in order to get information helping to improve one's efficiency. Benchmarking has pointed out to benefits and deficiencies of business operation and has consequently facilitated setting of realistic objectives during the entire process of business operation. The benchmarking structure and its efficiency keys together with component parts are as follows:

- scope of production: number of units/square metres of residential area,
- productivity: unit/employee or square metres of residential area/employee, sales/employee,
- operating revenues,
- labour costs,
- fixed assets,
- share of exports (in %),
- market share in Slovenia,

- net profit,
- inventories: coefficient of inventory turnover,
- days of capital/inventories/receivables tie-up,
- share of material in sales,
- share of labour costs in sales,
- income/fixed assets,
- economic efficiency,
- short-term indebtedness,
- quality: thermal insulation, acoustic insulation, fire resistance, house durability, seismic safety, exterior,
- time: land and documents preparation, house manufacture and assembly,
- prices: price structure, assembly price, cost price, selling price.

3. Selection of indicators specifying productional and economic efficiency (See Table 3).

4. Comparison of results

In the fourth phase the benchmarking team has established the importance of gaps in comparison with the best practices in Slovenia and analyzed the reasons for these gaps.

5. Propositions for improvement after the comparison with the best practices

In this phase of the process the company has prepared an improvement programme considering the results obtained with the benchmarking method and today this programme has already been taking place.

Table 2

PROJECT SCHEDULE

PHASE	CONTENT	PURPOSE
FIRST PHASE	Analysis of prefab houses market: <ul style="list-style-type: none"> • Slovenian market • European market with special emphasis on German and Austrian market. Analysis of individual segments of prefab houses market: <ul style="list-style-type: none"> • standard prefab houses • log cabins • bio-houses 	To acquire information on: <ul style="list-style-type: none"> • activities concerning prefab houses market • activities concerning individual market segments
SECOND PHASE	Identification of competitive companies and comparison between them, especially in view of financial and marketing functions	To establish gaps after performing the analysis and finding reasons for them.
THIRD PHASE	Preparation of financial and marketing strategies	Making propositions for gaps removal. Preparation of final report.

Prefabricated construction

The prefabricated houses construction has had a several year tradition in Slovenia although the available data indicate that in Slovenia less than 4 % of all houses are prefabricated while in the Western European countries there are 20 % of prefabricated apartments (an increasing enquiries for prefabricated houses has been lately established in Spain, Portugal and Turkey) and in Canada even 50 %.

Having in mind the project task purpose we are especially interested in prefab houses market trends. In the period 1994 – 1999 the average production was 1010 units per year or 147.434 sq.m. of area. In the same period the average share of exports reached 88 % and 12 % of the entire yearly production of prefab houses were sold on domestic market.

In 1999 the volume of entire production of houses and other buildings decreased from 4060 to 2733 units or from 191.030 sq.m. to 160.258 sq.m. and

the share of exports diminished as well. On the other side the sales increased on domestic market by 7 % (from 12 % in 1998 to 19 % in 1999) or from 130 to 188 units. Within the entire mass of sold apartments these figures represent 3,6 % of units or 5,8 % of area. However, partial data for 2000 and 2001 indicate again a rise in production and rate of exports. It can be concluded that present trends in sales of prefab houses move in positive direction and that natural elements, among them wood undoubtedly, are becoming more and more important.

Results and comparison

The comparison of results has been effected on two levels, namely:

- Comparison of company business efficiency indicators (See Table 3)
- Comparison of data on prefab houses production and business operation for Marles Hiše, Jelovica Hiše and Riko Hiše. (See Tables 4, 5 and 6).

Table 3

DATA¹ ON PREFAB HOUSES PRODUCTION AND PRODUCTIVITY FOR MARLES HIŠE, JELOVICA HIŠE AND RIKO HIŠE

in 000 SIT

Number	Item/Company	MARLES Hiše	JELOVICA Hiše	RIKO Hiše
1.	Staff number	437	101	34
2.	SCOPE OF PRODUCTION			
	- number of units	593	122	35
	- sq. m. of residential area	90.076	20.604	5.250

¹ Data are indicated in Slovenian tolar (SIT). For comparison reasons see exchange parity rates (1.3.2003, BS Ljubljana):

1 HRK = 30,34 SIT

1 USD = 254,93 SIT

1 EUR = 223,14 SIT

Selling prices indicated in foreign currency did not change in years 2000 – 2002.

3.	PRODUCTIVITY - unit/employee - sq. m. of residential area/ employee -sales/employee	1,37 218 10.764	1,27 203 21.232	1 154 13.075
4.	Operating revenues	4.703.687	1.320.537	721.883
5.	Labour costs	1.083.480	253.915	101.977
6.	Fixed assets	2.152.988	920.787	354.435
7.	Share of exports (%)	80	45	75
8.	Market share in Slovenia (%)	11,36	7,1	2,34
9.	INVENTORIES – coefficient of inventory returns	13,9	9,0	3,60
10.	TIE-UP of: - inventories - receivables	26,1 34	40 46	61,78 54,35
11.	Share of material in sales	6,98 %	5 %	24,6 %
12.	Share of labour costs in sales	23 %	19 %	14,35 %
13.	Income/fixed assets	2,29	1,62	2,01
14.	Economic efficiency	101	-	87
15.	Short-term indebtedness (Dbt/R)	0,22		0,6304

We have collected data for three typical houses of the above mentioned three producers and on their basis we have determined the efficiency of production as well as financial and selling functions. The collected data indicate that these companies use different ways or methods of calculations and that their pricing policy is also different.

Table 4

DATA ON TYPICAL PREFAB HOUSES, SERVING AS A BASIS
 FOR COMPARISON BETWEEN BENCHMARKING PARTNERS

Company/ indicator	MARLES Hiše	JELOVICA Hiše	RIKO Hiše
1. Name of prefab house	Clara	Jelka	Riko
2. Surface/sq.m.	145 sq.m.	160 sq.m.	160 sq.m.
3. Land size	500 – 600 sq.m.	500 – 600 sq.m.	500 – 600 sq.m.
4. Technological process	1. Manufacture of elements 2. Assembly 3. Installation and craftsmen work 4. Finishing work	idem	idem
5. Use of materials	- wood (solid wood and wooden fibres) - insulation material	idem	idem
6. Guarantee period	- roof, facade: 10 years - construction: 25 years	25 years	No limits under normal maintenance conditions

Table 5

DATA ON TYPICAL PREFAB HOUSE – QUALITY

Quality criteria	MARLES house	Jelovica house	RIKO house
Thermal insulation	Wall: 0,17 W/m ² K Wall, ceiling: 0,18 W/ m ² K	Wall: 0,185 W/ m ² K Wall including joinery: 0,22 W/ m ² K	0,25 W/ m ² K
Acoustic insulation	Roof: Rh = 54 db Ceiling: Rh = 54 db Wall = 48 db	56 db	External wall (classic facade): 42 db
Fire resistance	F60	F30 according to standard F60 for external walls	F60
House durability	80 years or more	50 years and more	No limits under normal maintenance conditions
Seismic safety	Internal calculation: IX.MOS		Good: - largepanel system supported by glued girders. Not measured according to ZAG.
Exterior	Optional exterior and adaptability to the environment	Optional exterior and adaptability to the environment	Optional exterior and adaptability to the environment

Table 6

DATA ON TYPICAL PREFAB HOUSE – TIME AND PRICE STRUCTURE

in 000 SIT

Item/Company	MARLES Hiše	JELOVICA Hiše	RIKO Hiše
SURFACE	150 sq.m.	150 sq.m.	150 sq.m.
1. Completion time			
- land and documents preparation	9 – 12 months	12 – 14 months	1 year
- house manufacture	5 days	4 – 6 days	5 – 6 days
- assembly	10 days	10 days	60 days
2. Price structure			
a) Costs of entire superstructure			
- SIT			
- labour costs:	1.443.571,00	1.655.710,00	1.800.000,00
per unit	9.952,00	11.040,00	12.857,14
per sq.m.			
- costs of materials:	231.399,00		250.000,00
per unit	1.595,00		1.785,71
per sq.m.			
b) Production costs			
- costs of materials (direct)	3.555.387,00		5.400.000,00
per unit	24.511,00	4.476.411,00	38.571,43
per sq.m.	897.908,00	27.977,55	350.000,00
- costs of services	6.190,00		2.500,00
per unit			
per sq.m.	242.035,00		1.320.000,00
- labour costs (direct):	1.669,00	306.600,00	9.428,57
per unit		1.916,25	
per sq.m.			

c. Assembly:			
- labour costs (direct):	59.128,00		720.000,00
per unit	408,00		450,00
per sq.m.			
- costs of services (direct):	359.432,00		1.400.000,00
per unit	2.478,00		8.750,00 (160 sq.m.)
per sq.m.			
	4.809.386,00	6.152.070,00	9.190.000,00
Direct costs:	33.155,00	38.325,00	57.437,00
per unit	(64 %)	(70 %)	(71 %)
per sq.m.			
	2.652.477,00	2.618.030,00	3.710.000,00
Indirect costs:	18.287,00	16.363,00	32.187,00
per unit	(36 %)	(30 %)	(29 %)
per sq.m.			
			12.989,920
	7.461.803,00	8.760.100,00	81.187,500 (160 sq.m.)
COST PRICE	51.443,00	54.562,00	
per unit			-
per sq.m.			
	- basic price:	- basic price:	
	8.699.970	10.190.400,00 SIT	
SELLING PRICE		- turn key price:	basic price:
		20.699.400,00 SIT	14.000.000,00

Source: Marles hiše. Jelovica Hiše, Riko Hiše

Business operation results in 2000:

- Marles Hiše finished its business year with profit;
- the part of labour costs within the income was the lowest in Riko Hiše d.o.o. (14 %),
- the biggest market share, the largest volume of production and the highest export rate in Slovenia belonged to Marles hiše; moreover, Marles had the lowest costs of raw materials and other materials within its income.

The highest productivity, measured in square metre of residential area per employee has been established in Marles Hiše (218 sq.m.) while the highest share of sales per employee has been noticed in Riko Hiše (21.232). The second indicator offers a reverse picture of the first one which is the result of sales income structure.

***Comparison between the companies Marles hiše,
Jelovica hiše and Riko hiše:***

- Coefficient of inventory turnover and tie-up of receivables and inventories:
 1. the highest coefficient of inventory turnover has been established in Marles hiše (13,9), followed by Jelovica hiše (9) and Riko hiše (3,6);
 2. days of receivables tie-up: 34 days in Marles hiše, 46 days in Jelovica hiše and 54,35 days in Riko hiše;
 3. days of inventories tie-up: 26,1 days in Marles hiše, 40 days in Jelovica hiše and 61,78 days in Riko hiše.
- Short-term indebtedness has been the lowest in Marles hiše, namely 0,22;
- Share of material in sales has also been the lowest in Marles hiše (6,99 %) and the highest in Riko hiše (24,6 %).

The above data confirm that Marles hiše devotes special attention to its financial functioning which is also confirmed by its financial indicators.

The benchmarking method has been used for three typical houses named Clara, Jelka and Riko:

- Clara has the lowest cost price per square metre of residential area (51.443 SIT/sq.m.).
- The production share for Clara is 64 % of the price structure and for Riko 54 %.
- The biggest differences are present in the cost price structure (the assembly part included). This is the result of different calculations or other factors (See Table 7).

Table 7

REVIEW OF BENCHMARKING PARTNERS PRICE STRUCTURE

in 000 SIT

Structure	Marles hiše	Riko hiše
Production cost	4.695.330	7.070.000
Assembly cost	418.560	2.120.000
Entire superstructure	1.674.970	2.050.000
Cost price (margin excluded)	6.788.860	9.330.000
Cost price	7.461.803	12.990.000
Selling price	8.699.970	14.000.000

- Manufacture time: the production times for all three types of prefab houses, namely Clara, Jelka and Riko hiša, are more or less the same. Jelovica hiše has set a norm for its house Jelka, namely 450 hours for the manufacture and 430 hours for assembly.
- Quality: according to the technical data all three houses comply with the established technical standards. The advantage of Riko house is wood.
- For the application of benchmarking method it is not enough to have at disposal the balance sheet data but also the analysis of indicators per units is required.
- It has to be pointed out that results may have certain methodological and substantial deficiencies but nevertheless, they can serve as a basis for the preparation of improvement plan.

Conclusion

The basic purpose of benchmarking is to enhance the competitive capacities on the basis of comparison with the best practices (See Table 8). For this reason the improvement plan should be directed towards:

- improvement of technology;
- better exploitation of available potentials (increase in productivity for 30 – 50 %);

- establishment of norms for the purchase of materials, for inventories, capital tie-up, costs;
- pricing policy and prices including cost price planning (structure), differential policy of selling prices (basic price offer, additional offer, differential selling commissions);
- developing of new activities in the domain of marketing;
- criteria for sales financing;
- ensuring an efficient coordination between business functions.

Table 8

INDICATIVE EVALUATION OR ANALYSIS OF BUSINESS OPERATION FOR RIKO HIŠE

Field	Findings – notes	Optimal measure
Quality		
Price		
Time		

Considering a small scope of production and offer of Riko hiše d.o.o. , it is not necessary to perform the overall market analysis. For practical reasons other methods or researches can be applied using already gathered data. On the basis of results and findings the members of benchmarking team have prepared a concrete improvement plan.

PROPOSITIONS AND DIRECTIONS

SWOT analysis

Benefits:

- high quality of prefab houses,
- big reserves in technological and human resources,
- sufficient quantities of raw materials.

Deficiencies:

- low productivity,
- marketing weaknesses,
- excessive costs of financing,
- ineffective reduction of business operation costs,
- pricing policy.

Opportunities:

- increasing enquiries for prefab houses in Western Europe,
- selling of technology to the countries of former Soviet Union.

Risks:

- strong competition in Western Europe,
- weak growth of enquiries for prefab houses in Slovenia.

Objectives:

- rise in competitive capacities,
- rise in production efficiency,
- rise in economic and financial efficiency,
- breakthrough in foreign markets and increase in exports.

Table 9

IMPROVEMENT PROPOSITION

Field of activities	Bearer	Envisaged effect
PURCHASE: - efforts to reduce prices of materials - optimal scope of materials purchase (payment and time) - time limits		
PRODUCTION: - technological improvements - rise in productivity by x % - rise in economic efficiency - reduction of complaints number - quality improvement		
ASSEMBLY: - reduction of assembly hours number - improvement of assembly organisation - choice of the best subcontractors		
MARKETING: - development of marketing strategy - development of approach to new markets - new selling methods		
FINANCING:		
BENCHMARKING: - follow-up of improvement results		

Concluding word

The benchmarking process as performed until now in the company Riko hiše d.o.o. provides insight, comparison and identification of gaps on the basis of internal and external data. The selected efficiency keys have pointed out to the important differences between the benchmarking partners. On the other hand the proposed improvement measures can only lead progressively to the efficiency improvement. The experience gathered until now can only confirm the above mentioned fact that benchmarking is extremely demanding and intensive process requiring a systematic and long-term policy.

The company Riko hiše has been faced with strategic dilemmas and corresponding searching for new opportunities. Therefore, the content of benchmarking method as an approach and way of solving problems represents an extremely useful guidance. Benchmarking is a handy tool for the company to acquire new useful skills. And these new skills will help managers to make better business decisions.

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PRIMJENA BENCHMARKINGA KAO MENADŽERSKOG SREDSTVA U MONTAŽNOJ IZGRADNJI

Sažetak

Članak opisuje praktičnu primjenu benchmarkinga kao metode za usporednu ocjenu tvrtki angažiranih u montažnoj izgradnji. Za primjenu benchmarkinga u praksi odabrana su tri proizvođača montažnih kuća. U proizvodnji montažnih kuća uzeta su u obzir tri ključna čimbenika izvedbe:

- vrijeme izgradnje
- cijena
- kvaliteta

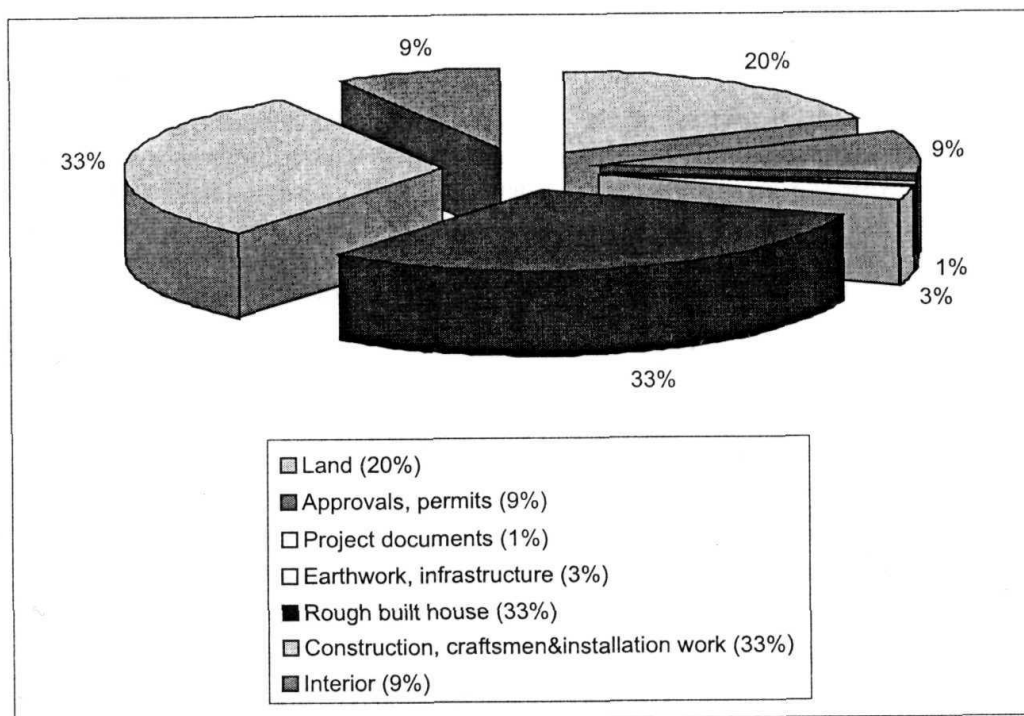
Mjerenje i usporedba rezultata tvrtke s onima njihovih konkurenata, daju korisnu informaciju o tome kako poboljšati poslovnu učinkovitost. Rezultati dobiveni benchmarking metodom koriste se kao temelj za izradu plana poboljšanja čiji je cilj unaprijediti sljedeće domene poslovnih aktivnosti: tehnologiju, prodaju i kupovinu, politiku cijena, financiranje i marketing. Na taj način benchmarking predstavlja korisno sredstvo kako za menadžere tako i za tvrtke - sredstvo stjecanja novog primjenjivog znanja i boljeg odlučivanja menadžera.

ENCLOSURES – GRAPHS

Graph 1

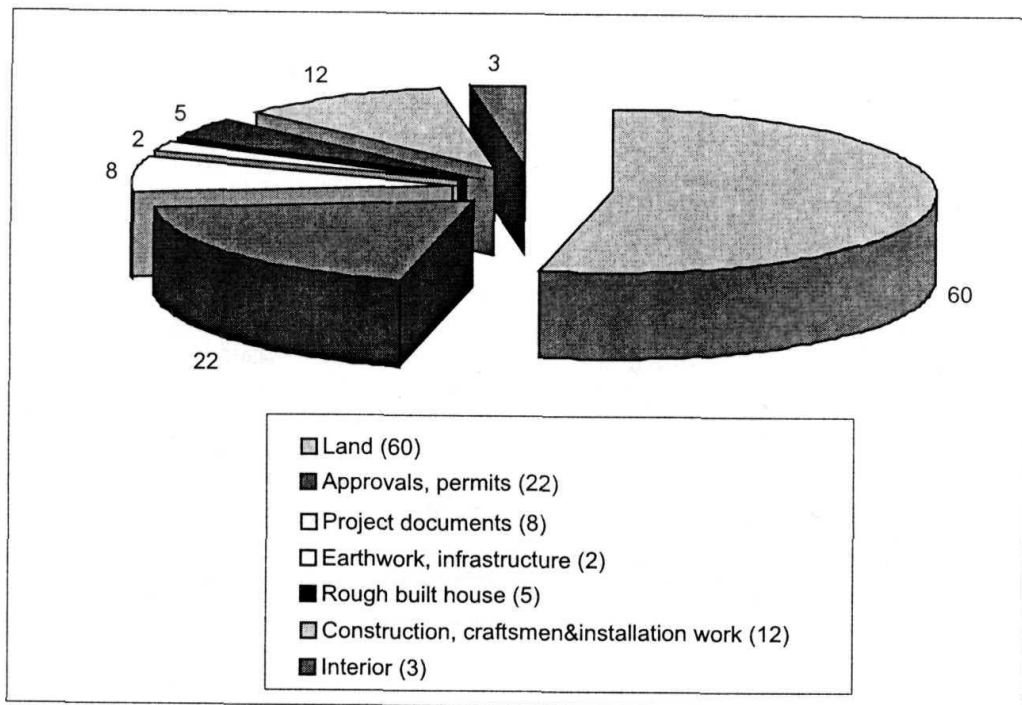
Price structure of prefab house Jelovica

(Source: Jelovica, March 2001, page 6)



Graph 2

Review of time structure concerning individual activities
within the construction of prefab house Jelovica (in weeks)
(Source: Jelovica, March 2001, page 6)



Graph 3

Price structure comparison for prefab houses Marles and Riko.

(Source: Jelovica, March 2001, page 6)

